

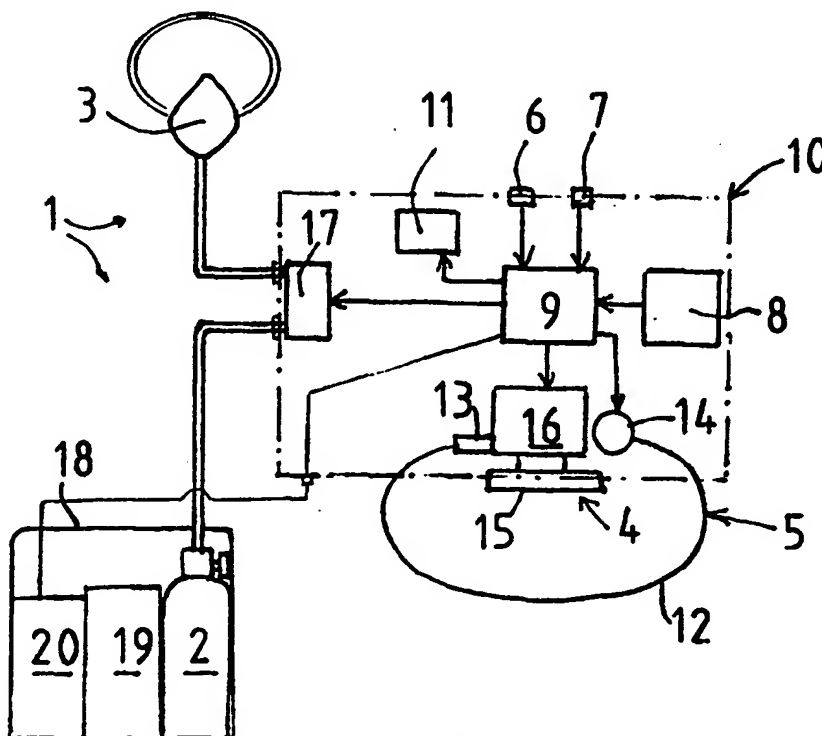


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: RESUSCITATION APPARATUS**(57) Abstract**

A resuscitation apparatus for resuscitating a patient, such as an accident victim, which resuscitation apparatus includes breathing aid apparatuses (1) such as an oxygen container (2) and a breathing mask (3) with necessary gashoses etc. The resuscitation apparatus also includes a heart massage apparatus (4) for giving heart massage to the patient, a fastening device (5) for pressing the heart massage apparatus against the chest of the patient; sensors for continuously monitoring the condition of the vital functions of the patient, such as the heart-beat and the breathing frequency, a selecting device (8) for inserting the patient's data, such as the size of the patient, into a steering device, and a steering device (9), such as a computer, a microprocessor or the like for steering the function of the breathing aid devices (1) and the heart massage apparatus based on the data fed from the sensors and the selecting device; the heart massage apparatus and the steering device, and preferably also the sensors and the selecting device are formed as one compact functional unit (10), which is fastenable onto the patient's chest whith the fastening device.



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Resuscitation apparatus.

The objective of the invention is a resuscitation apparatus defined in the first part of claim 1. The victims of accidents could often be saved with fast and correct resuscitation-procedures. The problem with accidents is that a person with knowledge of resuscitation that could help the victim is not usually at hand, or such a person can not be acquired at the place of the accident fast enough. Portable breathing aid apparatuses are previously known that include an oxygen container and a breathing mask with necessary gashoses etc. It is however not possible to resuscitate a person whose heart has stopped with only breathing aid devices.

The purpose of the invention is to bring forward a new type of resuscitation apparatus which makes an automatic resuscitation of an accident victim possible.

Furthermore the purpose of the invention is to bring forward a resuscitation apparatus which anyone can utilise for resuscitating a victim without the need of special resuscitation training.

The resuscitation apparatus according to the invention is characterized by that which is shown in claim 1.

A resuscitation apparatus according to the invention includes breathing aid apparatuses, such as an oxygen container and a breathing mask with necessary gashoses etc.

According to the invention the resuscitation apparatus also includes a heart massage apparatus for giving heart massage to the patient; a fastening device for pressing the heart-massage apparatus against the chest of the patient; sensors for continuously monitoring the condition of the vital functions of the patient, such as the heartbeat and the breathing frequency; a selecting device for inserting the patients

data, such as the size of the patient, into a steering device; and a steering device, such as a computer, a micro-processor or the like for steering the function of the breathing aid devices and the heart massage apparatus based on the data fed from the sensors and the steering device. The heart massage apparatus and the steering device, and preferably also the fastening device, the sensors and the selecting device are formed as one compact functional unit (10) which is fastenable onto the patients chest with the fastening device. A previously defined instruction, such as a program, belongs to the steering device, which instruction defines a suitable oxygen amount and a suitable strength of the heart massage for the patient according to the data acquired from the sensors and according to the patients data, for example the patients size. In this way a baby as well as a XL-sized adult gets the right amount of oxygen and heart resuscitation with appropriate strength.

In one embodiment of the resuscitation apparatus a showing device is included for showing the patients vital functions, such as the heartbeat and/or the breathing frequency measured with the sensors; and the showing device is arranged in connection with the mentioned functional unit.

In one embodiment of the resuscitation apparatus the fastening device includes a tensioning belt which is arranged to reach around the chest of the patient and a closing device for closing tensioning the tensioning belt.

In one embodiment of the resuscitation apparatus the resuscitation apparatus includes a tensioning device functioning with a strength apparatus which tensioning device is steered with a steering apparatus for adjusting the tensioning force of the tensioning belt according to the size of the patient to a suitable tension.

In one embodiment of the resuscitation apparatus the heart massage apparatus includes a pressuring device which is controlled to press the patients chest at intervals within predestined time spaces.

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In one embodiment of the resuscitation apparatus the pressing device includes a strength apparatus, for example an electromagnetic strength apparatus, whose effect and operation is steerable with a steering apparatus based on the data from the sensors.

10

In one embodiment of the resuscitation apparatus the resuscitation apparatus includes a mixing apparatus for mixing fresh air with oxygen that is led from the oxygen container and is to be led to the breathing mask; and that the steering apparatus is arranged to steer the pressure and proportions of the fresh air and oxygen led to the mask according to the current state of the patient.

15

In one embodiment of the resuscitation apparatus the resuscitation apparatus includes a baglike box, which is adapted to, inside itself, receive the devices and apparatuses which belong to the resuscitation apparatus such as the breathing aid apparatuses and the functional unit. Spaces for customary first aid devices, such as bandage-, splint- and other similar material and/or a current source, such as an accumulator etc. may also be arranged in the baglike box.

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The advantage of the invention is that the resuscitation apparatus is easy to transport at all times in a car, a boat etc. or it can be kept home as a medicine-cabinet equipment. It is so easy to use that anyone can begin an effective resuscitation with the help of it directly after the accident has occurred. It can be modelled to a suitable size, made relatively light and an effective entirety. With the help of the steering device the apparatus is in operating condition in a couple of seconds and ready to begin the

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resuscitation which it accomplishes mainly independently.
The apparatus may be equipped with an own accumulator (for
example NiCd), but if it is necessary to continue the resus-
citation for a long time, or it is in any other way run
5 dry, the resuscitation apparatus may be provided with a
connection for outer current sources. In this way it can be
connected quickly with an auxiliary cable even to for exam-
ple the connection plug for the cigarette lighter in a car,
to another accumulator or another current source of this
10 kind. When the victim does not need resuscitation measures
any more the automatic steering of the steering device
steers a suitable oxygen-mixture for the patient to
breathe. Because of the feeding of pure oxygen and air the
victim receives a cleaner solution than in normal artifi-
15 cial respiration as CO₂ from the breathing does not form.
A resuscitation apparatus according to the invention is a
resuscitation apparatus for everybody. No special training
for its use is needed because of the easy operation of the
apparatus. Simple instructions may be arranged so that they
20 are easy to read for example on the baglike box. The resus-
citation apparatus could, because of its all-around abili-
ty, replace
the first-aid kit that is in use now.

25 In the following the invention is described in a detailed
way by references to the figures where

figure 1 shows a scematic section of one embodiment of the
resuscitation apparatus according to the invention;

30 figure 2 shows a scematic section of another embodiment of
the resuscitation apparatus according to the invention;

figure 3 shows scematically and axonometrically, seen from
35 the top, a functional unit belonging to the embodiment
according to figure 2.

figure 4 shows, axonometrically seen from below, the functional unit in figure 3;

figure 5 shows, from the side, the functional unit in figures 3 and 4; and

figure 6 shows the embodiment according to figure 2 in a functional state.

10 A resuscitation apparatus is showed in figures 1 and 2 for resuscitating a patient, such as an accident victim. The resuscitation apparatus includes breathing aid apparatuses 1 such as an oxygen container 2 and a breathing mask 3 with necessary gashoses. The resuscitation apparatus also
15 includes a heart massage apparatus 4 for giving heart massage to the patient. To make pressurizing heart massage possible the apparatus includes a fastening device 5. With its help the heart massage apparatus 4 is pressed against the chest of the patient. The resuscitation apparatus also
20 includes sensors 6, 7 for continuously monitoring the condition of the vital functions of the patient, such as the heartbeat and the breathing frequency. The resuscitation apparatus also includes a selecting device 8 with which the operator of the resuscitation apparatus may insert the patient data, such as the information of the size of the
25 patient, into a steering device 9 which is for example a computer, a microprocessor or the like. The steering device 9 is arranged to steer the function of the breathing aid devices 1 and the heart massage apparatus 4 based on the
30 data fed from the sensors 6, 7 and the selecting device 8. The heart massage apparatus 4 and the steering device 9, the sensors 6, 7 and the selecting device 8 are gathered together into a common box to form one compact unity, that is a functional unit 10 which is fastenable with a fastening device 5 onto the chest of the patient. The resuscitation
35 apparatus also includes a baglike box 18 which is ad-

apted to, inside itself, receive the devices and apparatuses which belong to the resuscitation apparatus, such as the breathing aid apparatuses 1 and the functional unit 10 and also first aid devices 19, such as bandage-, splint-
5 and other similar material and also a current source 20, such as an accumulator or similar. The resuscitation device also includes a showing device 11 arranged in connection with the functional unit 10 for showing the patients vital functions, such as the heartbeat and/or the breathing frequency measured with the sensors. It is possible to follow
10 the changing of the state of the patient and the recovery. The resuscitation apparatus also includes a mixing apparatus 17 for mixing fresh air with oxygen that is led from a oxygen container 2 and is to be led to the breathing mask
15 3. The steering apparatus 9 is arranged to steer the pressure and proportions of the fresh air and oxygen led to the mask according to the current state of the patient.

From figure 3 and 4 the compact and easy to handle construction of the functional unit 10 can be seen. The showing device 11 is arranged onto the functional unit 10. In connection with the showing device are signal lights for the oxygen pressure 21 and the accumulator voltage 22. The selecting device 8 includes a group of push buttons 23, 24,
25 25, 26, 27 in this example five and of which each one corresponds to a size data of a patient, for example SS (infant sized), S (small), M (medium), L (large), XL (extra large). By pushing the wanted selection button and by locking the choice with a locking button 28 the size data corresponding
30 to the selection button is translated to the steering device 9 which because of this chooses the suitable resuscitation force. The steering functions of the functional unit 10 are all electrical and the current is led from the accumulator 20 in the baglike box 18. A connection 100 for
35 outer current sources is also shown in the baglike box 18.

The flexible tensioning belt 12 belonging to the fastening device 5 may as shown in figure 6 be wrapped around the chest of the patient and be closed with the closing device 13 in its place. A special reeling device (not shown) may be arranged inside the functional unit 10 which reeling device is equipped with a tensioning device 14. The tensioning device may be steered with the steering apparatus 9 to adjust the tensioning force of the tensioning belt 12 according to the size of the patient to a suitable tightness. The tensioning device 14 is also controlled from the locking button 29 above the functional unit with electric control.

As shown in figure 4 the heart massage apparatus 4 includes a pressuring device 15 which is controlled to press the patients chest at intervals within predestine time spaces. The pressuring device 15 includes a strength apparatus 16, for example an electromagnetical function device whose effect and operation is steerable with a steering apparatus 9 based on the data from the sensors 6, 7. The sensors 6, 7 may be connected to the sensor-connections 30, 31 in the functional unit or they may be placed permanently on the lower surface of the functional unit 10 where they are placed against the body when the functional unit is tightened to its place.

As shown in figures 4, 5 the pressuring device 15 may include many individually controlled push buttons 32, 33, 34 of different sizes which are controlled with the steering apparatus 9. In this example the push buttons are organized axially in such a way that the innermost button 32 is circular, the next button 33 in size according to the diameter is placed as a ring around the smallest button 32 and the biggest button 34 is also placed as a ring around the button 33. The apparatus may use the buttons of different sizes in a way where the smallest button 32 gives the massage impulse on its own as in figure 5, or together with one or both of the buttons 33, 34.

According to figure 6 the resuscitation apparatus is used so that the functional unit 10 is tensioned around the victims chest with the flexible tensioning belt 12 in the functional unit module. The belt 12 is freed and is tightened from the locking button 29. The tension is adjusted automatically according to the size of the victim. The electrical cable 36 and the oxygen hose are connected to the functional unit 10 in the module. The oxygenmask 3 is fastened to the victims face and a neckrest is attached if necessary. The apparatus is switched on from the current switch 35 and is started by pushing the chosen button (23-27) according to the size of the victim simultaneously when pushing the locking button 28 for the choise. Sensors 6, 7 measure the victims heartbeat and respiration while steering the functions of the steering device 9 according to this. If the victim needs heart massage, the electromagnetically functioning pressuring device 15 gives the needed effective impulses within suitable time spaces with the buttons of different sizes that are placed in the bottom of the functioning unit. The force, effect and size of the impulse button used are defined automatically according to the size data is chosen with the buttons 23-27. The mixing apparatus placed into the functioning unit 10, such as an airpump takes fresh air through a filter and mixing this in the right proportions with oxygen coming from the oxygen container. The mixture is pumped to a breathing bag controlled by the automatic of a steering apparatus microprocessor which bag portions it with right proportions and pressure to the victim for breathing and resuscitation.

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The invention is not limited only to the embodiments mentioned above. Many variations are possible with the inventive idea defined by the claims.

CLAIMS

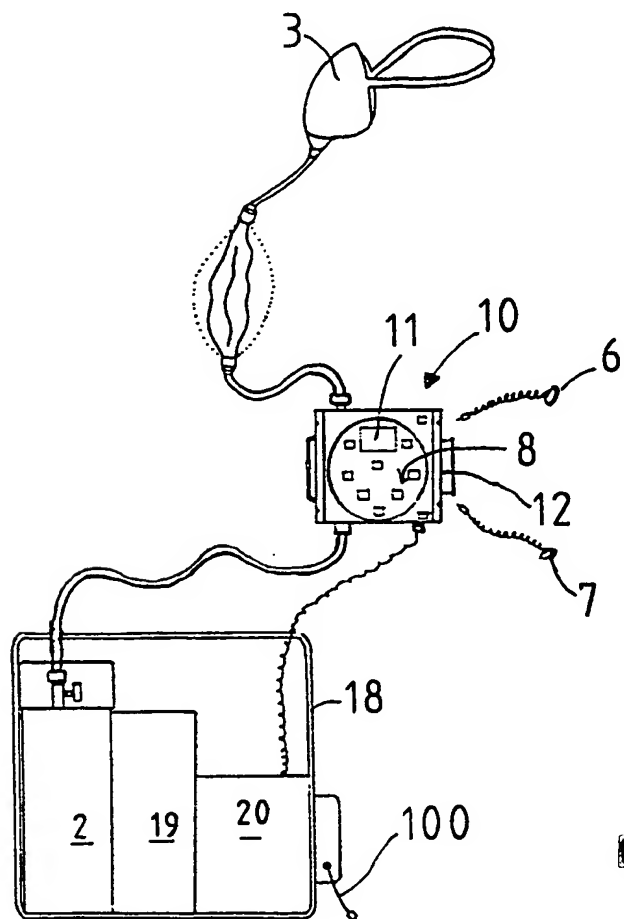
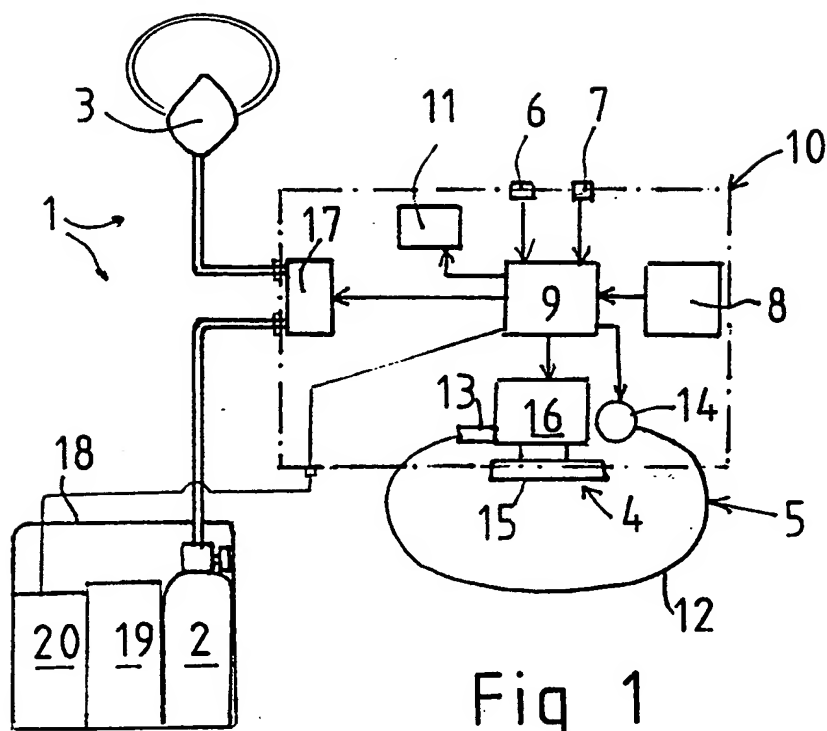
1. A resuscitation apparatus for resuscitating a patient, such as an accident victim which resuscitation apparatus includes breathing aid apparatuses (1), such as an oxygen container (2) and a breathing mask (3) with necessary gas-hoses etc. characterized in that the resuscitation apparatus also includes
- a heart massage apparatus (4) for giving heart massage to the patient,
 - a fastening device (5) for pressing the heart massage apparatus against the chest of the patient;
 - sensors (6, 7) for continuously monitoring the condition of the vital functions of the patient, such as the heart-beat and the breathing frequency
 - a selecting device (8) for inserting the patients data, such as the size of the patient, into a steering device and
 - a steering device (9), such as a computer, a microprocessor or the like for steering the function of the breathing aid devices (1) and the heart massage apparatus based on the data fed from the sensors and the selecting device; and that the heart massage apparatus and steering device, and preferably the sensors and the selecting device are formed as one compact functional unit (10), which is fastenable onto the patients chest with the fastening device.
2. A resuscitation apparatus according to claim 1 characterized in that the resuscitation apparatus includes an showing device (11) for showing the patients vital functions, such as the heartbeat and/or the breathing frequency measured with the sensors and that the showing device is arranged in connection with the functional unit (10).

3. A resuscitation apparatus according to claim 1 or 2
characterized in that the fastening device (5) includes
a tensioning belt (12) which is arranged to reach around
the chest of the patient and a closing device (13) for
5 closing and tensioning the tensioning belt.
4. A resuscitation apparatus according to claim 3
characterized in that the resuscitation apparatus includ-
es a tensioning device (14) functioning with a strength ap-
10 paratus which tensioning device is steered with a steering
apparatus (9) for adjusting the tensioning force of the ten-
sioning belt (12) according to the size of the patient to a
suitable tension.
- 15 5. A resuscitation apparatus according to any of the claims
1-4 characterized in that the heart massage apparatus (4)
includes a pressuring device (15) which is controlled to
press the patients chest at intervals within predestined
time spaces.
- 20 6. A resuscitation apparatus according to claim 5
characterized in that the pressuring device (15) includes
a strength apparatus (16), for example an electromagnetic
strength apparatus, whose effect and operation is steerable
25 with a steering apparatus (9) based on the data from the
sensors 6, 7.
7. A resuscitation apparatus according to claim 5 or 6
characterized in that the resuscitation apparatus in-
30 cludes a mixing apparatus (17) for mixing fresh air with
oxygen that is led from the oxygen container (2) and is to
be led to the breathing mask (3); and that the steering
apparatus (9) is arranged to steer the pressure and propor-
tions of the fresh air and oxygen led to the mask accord-
35 ing to the current state of the patient.
8. A resuscitation apparatus according to any of the claims

1-7 characterized in that the resuscitation apparatus includes a baglike box (18) which is adapted to, inside itself, receive the devices and apparatuses which belong to the resuscitation apparatus, such as the breathing aid apparatuses (1) and the functional unit (10).

9. A resuscitation apparatus according to claim 8 characterized in that the resuscitation apparatus includes customary first aid devices (19), such as bandage-, splint- and other similar material; and that a space is arranged in the baglike box for first aid devices.

10. A resuscitation apparatus according to claim 8 or 9 characterized in that the resuscitation apparatus includes a current source (20), such as an accumulator or the like, for providing the resuscitation apparatus with current; and that a space is arranged in the baglike box (18) for a current source.



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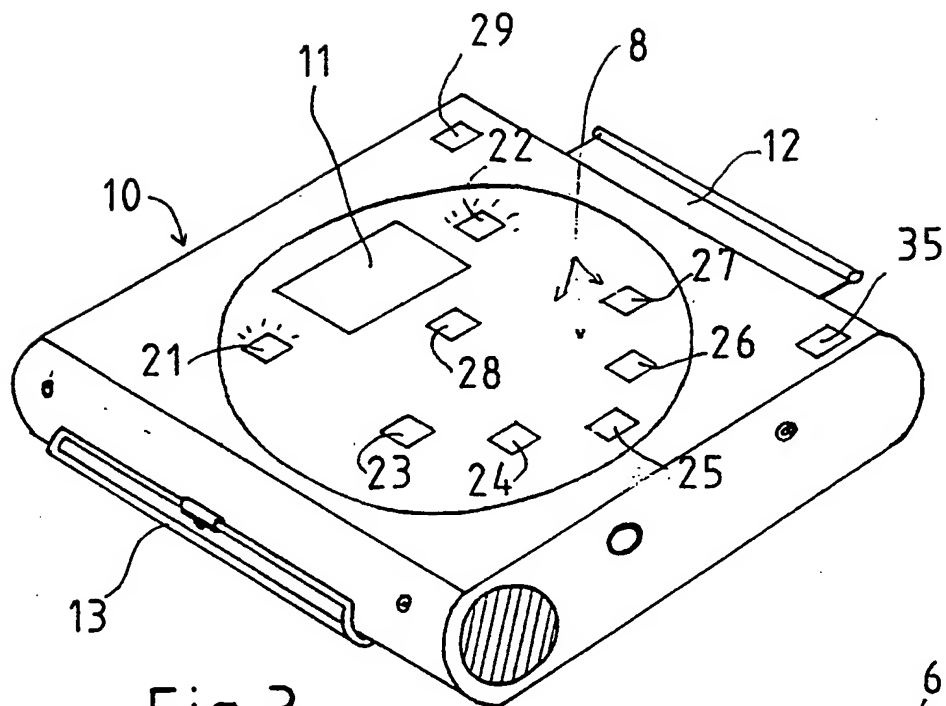


Fig 3

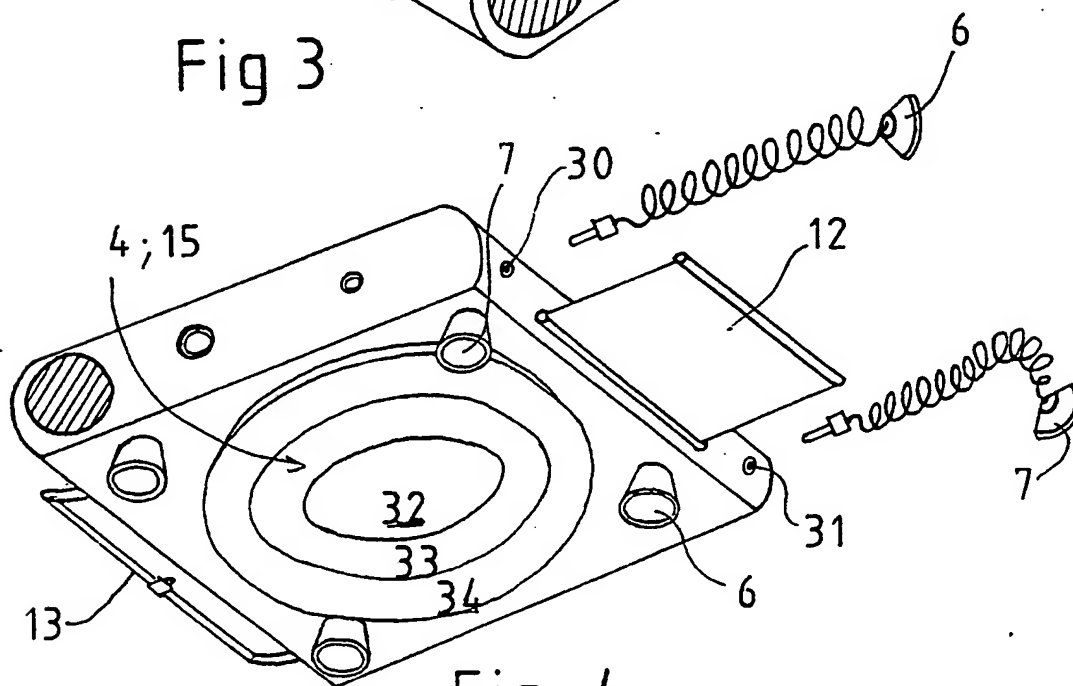


Fig 4

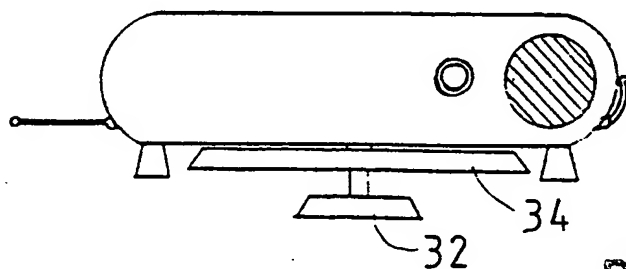


Fig 5

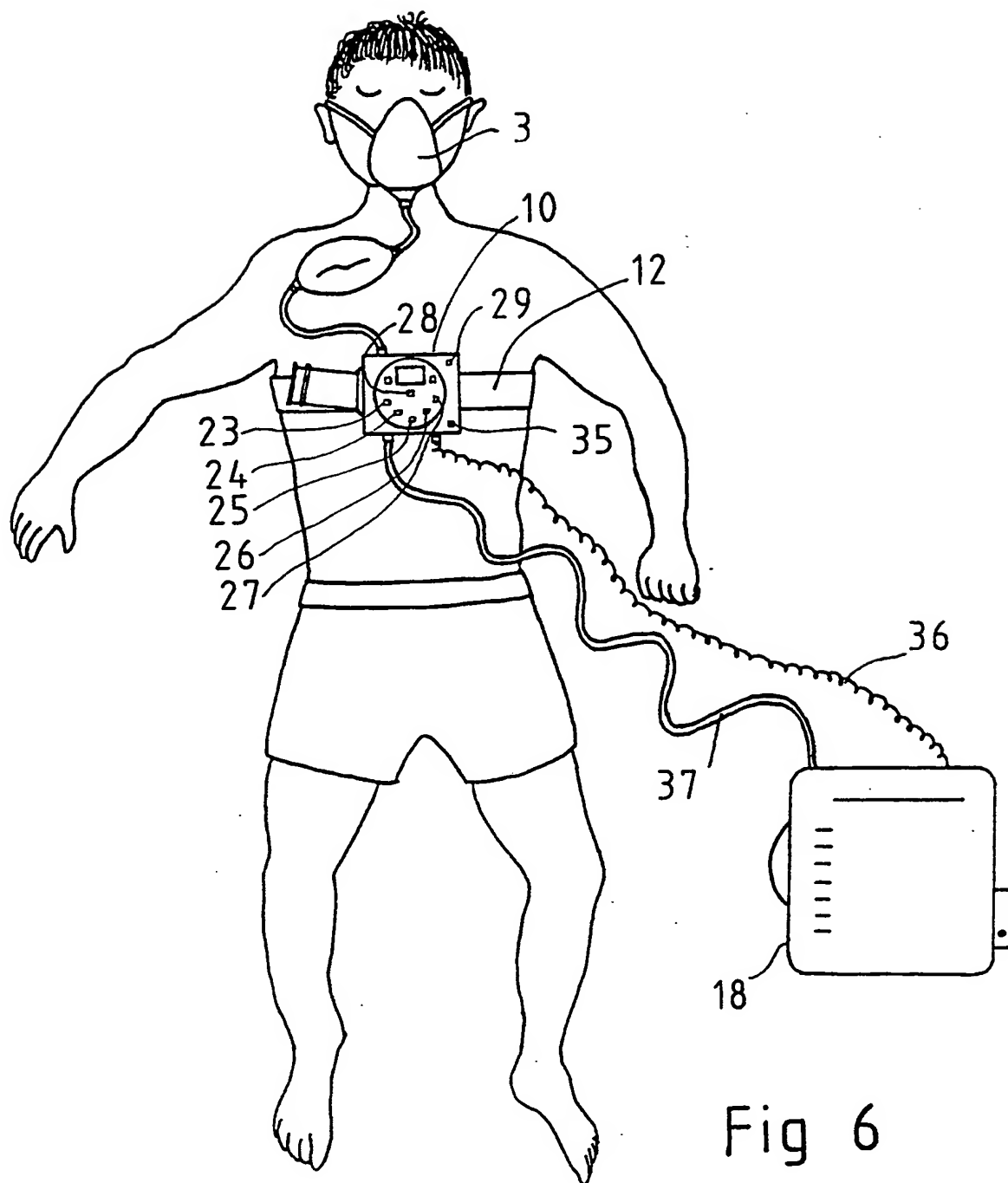


Fig 6

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 94/00169

A. CLASSIFICATION OF SUBJECT MATTER

IPC : A61H 31/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC : A61H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO, A1, 8909041 (CARDIOPULMONARY CORPORATION), 5 October 1989 (05.10.89), figures 1-8, claims 1-35 --	1-10
Y	WO, A1, 9005518 (THE JOHNS HOPKINS UNIVERSITY), 31 May 1990 (31.05.90), figures 1-11, claims 1-30 --	1-10
Y	US, A, 3509899 (C.E. HEWSON), 5 May 1970 (05.05.70), figures 1-7, claims 1-8 --	1-10
Y	US, A, 3461861 (C.E. BARKALOW ET AL.), 19 August 1969 (19.08.69), figures 1-13, claims 1-16 --	1-10

☒ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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Date of the actual completion of the international search

15 August 1994

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

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PCT/FI 94/00169

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP, A1, 0010908 (MICHIGAN INSTRUMENTS, INC.), 14 May 1980 (14.05.80), figures 1-12, claims 1-16 ----- -----	1-10

INTERNATIONAL SEARCH REPORT
Information on patent family members

02/07/94

International application No.
PCT/FI 94/00169

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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WO-A1- 9005518	31/05/90	CA-A- 2003384 EP-A- 0444128	21/05/90 04/09/91
US-A- 3509899	05/05/70	BE-A- 675104 DE-A- 1491745 US-A- 3511275	03/05/66 30/10/69 12/05/70
US-A- 3461861	19/08/69	NONE	
EP-A1- 0010908	14/05/80	AT-T- 2930 CA-A- 1133586 JP-C- 1369400 JP-A- 55054965 JP-B- 61035871 US-A- 4198963 US-A- 4273114	15/04/83 12/10/82 25/03/87 22/04/80 15/08/86 22/04/80 16/06/81